



# Distributed Team Decision Making

Successful long-duration space missions will depend on the ability of crewmembers to collaborate effectively under highly stressful conditions. Effective interpersonal relationships are critical as crews become more varied in terms of culture, gender and professional backgrounds. This project will yield techniques for predicting breakdown of team dynamics and performance; guidelines for effectively selecting, training, and assembling teams of astronauts; tools for self assessment and team feedback; and strategies for managing stress in multi-cultural and gender-mixed teams.

## Objective

Interpersonal tensions are one of the most problematic issues in long-duration space missions. They can jeopardize mission success by preventing crew members from cooperating on mission-critical tasks. Goals of this study are to (a) determine the effects of task- and team-related stressors on team performance in challenging situations; (b) develop and validate technologies to monitor affective responses of individual team members, and (c) identify effective team interaction strategies. These will establish a basis for countermeasures to prevent deterioration of team performance.

## Approach

A computer-based simulated search and rescue mission set in Antarctica was developed to study team interaction and decision making performance. Four-member teams work together to locate a lost party sent to repair a malfunctioning communication antenna. Teams must develop plans and strategies, share information, manage resources, and cope with unexpected problems under time pressure. Both task and team stressors are manipulated to induce cognitive and emotional arousal. Task performance, physiological measures (ECG, respiration, SCL, EMG, and PPG), voice and email communication, personality, team dynamics, and facial affect measures are being analyzed to identify the relations between stress, team interactions and task performance.

Initial studies indicate that success on the task reflects the extent of cooperation among team members; effective collaboration can overcome task stresses. Team success also reflects the degree of trust and acceptance team



members experience. Negative interpersonal interactions interfere with successful team performance. Physiological reactivity to task and team stressors can be detected and thus can serve as a trigger for introduction of countermeasures.

## Impact

The present study provides integrated physiological, self-report, behavioral, and performance measures from teams working together over time on a common task. Positive stress-coping behaviors extracted from the findings will serve as a basis for training crews to manage challenging events and interpersonal problems arising in long-duration space missions. Technologies will be developed for use by space crews as self-monitoring and stress-management systems.

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### Relevance to Exploration Systems

Mission success and failure hinges not only on sophisticated engineering, but on the human beings involved. Living and working on Mars or the Moon, with its requisite confinement, isolation, and physical differences from Earth, will put stressors on any individual. Crews going into space need to be properly selected, prepared, trained, and supported in order to succeed, both with each other and with ground operations teams. Because of the interdependence between teamwork and taskwork, success cannot be defined by initial task achievements alone. In order to triumph in space, it behooves us to identify interpersonal risks and create countermeasures for them just as we would for important complex mechanical systems.

### H&RT Program Elements:

This research capability supports the following H&RT program /elements:

ASTP: Advanced Studies Concepts & Tools

TMP: Advanced Space Operations

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